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5 August 2020

VIA EMAIL

Mr. Brandon Pursel
U.S. Environmental Protection Agency, Region 5
77 West Jackson Boulevard
Chicago, IL 60604

Re: Transmittal of Review Comments
Remedial Study Report for the Former Coke Plant (April 2020)
ArcelorMittal Indiana Harbor West, East Chicago, Indiana
Mabbett Project No. R7065000.006.001.003

Dear Mr. Pursel:

Under Contract No. 68HERH19D0019, Task Order No. 68HE0520F0058 and as specified in a Technical Direction Memo dated May 8, 2020, Mabbett & Associates, Inc. (Mabbett®) has completed a technical review of the subject document. Our comments on this document are provided as an attachment to this letter.

We appreciate the opportunity to support EPA on this project. If you have any questions or require additional information, please do not hesitate to call or email either of the undersigned.

Very respectfully,

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**TECHNICAL REVIEW
REMEDIAL STUDY REPORT FOR THE
FORMER COKE PLANT
APRIL 2020**

**ARCELORMITTAL INDIANA HARBOR WEST
EAST CHICAGO, INDIANA**

August 5, 2020

In response to Task Order 68HE0520F0058 under EPA Contract No. 68HERH19D0019, Mabbett & Associates (Mabbett) conducted a review of the April 2020 revision of the Remedial Study Report (RSR) for the Former Coke Plant (FCP) at the ArcelorMittal West (AMW) facility in East Chicago, Indiana. The RSR presents a summary of site conditions and evaluates potential corrective measures for groundwater impacted by light non-aqueous phase liquid (LNAPL). Mabbett's review focused on the technical adequacy of the corrective measure evaluations and justification for the RSR's final recommendation. Comments developed during review of the RSR are presented below.

The AMW submittal also included a response to EPA's March 6, 2020 comments on the initial version of the RSR, Environmental Indicator (EI) documentation, and tables detailing estimated costs for each potential corrective measures alternative. As requested by EPA in the Technical Direction Memo dated May 8, 2020, each of these components has also been reviewed. Comments on these components are also provided below.

I. GENERAL COMMENTS ON THE REVISED RSR AND COST APPENDIX

1. Section 4 of the RSR lists four corrective action objectives (CAOs) for the FCP:

- Remove identified LNAPL pursuant to EPA's letter dated April 28, 2015.
- Meet the conditions described in the CA725 and CA750 EIs.
- Prevent exposure to groundwater where groundwater data quality objectives cannot be attained within a reasonable period of time for drinking water and construction worker exposures.
- Prevent reasonably anticipated human exposures to surface waters containing constituents of potential concern (COPC) at concentrations of concern.

In Specific Comment 3 from the March 6, 2020 letter, EPA noted that these CAOs lacked specific detail. In response, the RSR was expanded to establish the following key performance metrics:

- Reduction or elimination of measurable LNAPL in wells.
- Abatement of unacceptable dissolved-phase COPC concentrations downgradient of the LNAPL source.
- Achievement of applicable State of Indiana rules for groundwater and surface water quality.

As also noted in the comment, EPA expects that the Corrective Measures Implementation Work Plan (CMIWP) will identify specific and actionable decision criteria, building on the "example performance criteria" in Table 4-1. For example, the CMIWP should specify the allowable thickness and transmissivity of residual LNAPL in the subsurface at FCP, time frames over which minimal LNAPL reductions would be considered asymptotic, targeted LNAPL composition changes, the groundwater and surface water quality criteria to be achieved, and similar performance and decision-making metrics. The CMIWP must also identify wells to be monitored for LNAPL thickness and dissolved phase contaminant concentrations directly downgradient of the LNAPL source (to provide an earlier indication of any increased partitioning than sentinel wells). Even where groundwater and/or surface water quality criteria have already been met, the

CMIWP should include those criteria to ensure that AMW continues to assess those criteria. EPA expects that AMW will consider multiple lines of evidence in demonstrating achievement of CAOs.

While such detailed discussion can be provided in the CMIWP, the RSR must include an assessment of surfactant enhanced recovery (SER), *in situ* chemical oxidation (ISCO), and *in situ* thermal remediation (ISTR) in terms of potential for successful cleanup. Expand the RSR to specifically indicate whether and how each of the three retained corrective measures will contribute to achievement of the overall CAOs and key performance metrics. The comparative analysis in Section 7 should provide insight as to the strengths and limitations of each retained corrective measure (relative to each other). The options should be evaluated for their ability to achieve each of the CAOs and performance metrics within a reasonable time frame. A table similar to Table 7-1, numerically or qualitatively (i.e., low, medium, high) ranking each potential corrective measures alternative against the threshold and balancing criteria, would be especially useful.

2. Each of the potential corrective measures evaluated include 7 years of groundwater monitoring. This assumption is problematic for several reasons. Revise the RSR to address the following issues.

- According to Section 6.1.2.5 of the RSR, this duration “reflects a reasonable time frame that may be necessary to demonstrate stable or decreasing volatile organic compound (VOC) concentrations in groundwater site-wide.” Clarify whether 7 years is also considered a reasonable duration for continued monitoring of LNAPL thickness.
- It is preferable to discuss the duration of the groundwater monitoring program in terms of contaminant concentration targets rather than a set number of years. Depending on remedy performance and progress against CAOs, it may be appropriate to shorten or lengthen the duration of monitoring (evaluating the LNAPL and dissolved phase monitoring components independently). As noted on page 18 of the RSR, EPA has recommended that AMW take an adaptive approach to groundwater monitoring during (and after) remedy implementation. Revise the RSR to include a performance-based approach for groundwater monitoring, keeping the presumed seven-year duration for cost estimating purposes only.
- Cost tables in Appendix B suggest that monitoring will begin the year after cleanup activities are implemented (e.g., after injection of surfactant, chemical oxidant, or steam), but the RSR should include detail on when the monitoring program would begin under each of the three alternatives (taking into consideration the varied time frames for implementation of the three remedies). Moreover, it is critical that AMW establish a current baseline for the LNAPL footprint and dissolved phase COPC concentrations across the FCP prior to corrective measures implementation. It appears that the most recent groundwater data for the FCP are approximately three years old (September 2017). Use of a dated baseline is inappropriate.

3. It appears that the threshold and balancing criteria have been inconsistently applied to the three corrective measures alternatives as part of the comparative analysis in Section 7 and Table 7-1. Examples of such inconsistencies include, but are not limited to:

- Both SER and ISCO require good contact of the surfactant or oxidant with the residual LNAPL because both technologies primarily act at the contact surface. Both options are also facilitated by high permeability and homogeneity of the formation. These factors are not technology dependent. However, the second and third paragraphs of Section 7 suggest that SER can be effective at this site, but ISCO will be hindered by “low permeability matrices” and the fact that oxidation “will take place at the surface of the NAPL only.” It is unclear why these factors should be considered drawbacks for ISCO but not for SER.
- The fourth paragraph in Section 7 states that ISTR is “capable of removing the vast majority (greater than 99 percent) of contaminant mass from even heavily contaminated sources” but “a small fraction of

the contaminant mass may remain after treatment.” The RSR does not indicate the percent mass removal expected using SER or ISCO, but it is unlikely that treatment will continue until *no* residual LNAPL remains. The fact that a small amount of LNAPL would remain after ISTR implementation should not be considered a drawback. Instead, the ability to achieve such high removal rates should be viewed as a benefit, possibly even raising this option above SER and ISCO on this criterion (depending on the expected levels of LNAPL removal for those technologies at the FCP).





- When comparing estimated costs for each of the three potential corrective measures alternatives, there is no justification for listing even the cheapest cost as “high.” While the costs are assuredly higher than those for less complex sites at AMW, all three costs estimated for the FCP are within the same order of magnitude. As such, cost should play a smaller role in selection of a recommended remedy.
- Table 7-1 notes that ISCO and ISTR can treat both LNAPL and dissolved-phase VOCs. The comparative analysis does not draw attention to these relative strengths, nor does it mention the fact that AMW’s preferred alternative, SER, intentionally increases dissolved-phase contamination and relies on groundwater extraction to contain and eliminate that contamination. The risk of enhancing mobility of contaminants in the LNAPL should be considered in the comparative analysis and remedy selection.
- Table 7-1 highlights the need for ex-situ treatment of contaminated materials when performing ISTR but not for SER. Only ISCO requires no ex-situ treatment and disposal of extracted materials.
- Table 7-1 notes that multiple injection events will likely be required for ISCO but should also acknowledge that SER will require multiple injection events, as described in Section 6.2. This row of the table should also note that ISTR will require a longer time period after the heating event to reach maximum efficacy.
- The table includes no evaluation of the alternative with regard to green remediation, even though the last paragraph in Section 7.1 touts this as a benefit of SER. Expand the table to include an evaluation of each alternative’s environmental footprint in the implementability row.
- Reasons presented in Section 7.3 for easy acceptance of SER by the community (i.e., little additional traffic, no off-site impacts, shortening time to remove LNAPL, no risks to workers or community) are also largely applicable to ISCO and ISTR. As such, they should not be presented as distinguishing factors that recommend SER over other options.

The comparative analysis should be reviewed to ensure that the three alternatives are evaluated evenly against the threshold and balancing criteria. Moreover, there should be clear justification as to why the selected option was recommended. The best way to avoid inserting bias into the comparison is to numerically rank each alternative against the selection criteria and tally the results. The quantitative scores can be relative (i.e., 1, 2, and 3), with options ranked as tied when there is no substantial difference between them. Revise the RSR accordingly and ensure that there is consistent and clear justification for selecting one remedy over the others. The RSR should not give the impression that the analysis was written with an eye toward selecting a pre-determined remedy.

4. To accelerate implementation of institutional controls (ICs) for the FCP, we recommend that the RSR be expanded to include an appendix with draft language for the proposed groundwater use restriction and deed restriction. All information needed to develop those drafts is currently available.
5. As noted at the top of page 18, AMW will follow an adaptive approach to groundwater monitoring. AMW should also consider an adaptive approach to FCP cleanup. Given the inability to remove LNAPL via hydraulic extraction, AMW is evaluating additional treatment options to move closer to achieving CAOs. Upon achievement of asymptotic conditions using one treatment option, it may be beneficial to address a smaller LNAPL mass with another treatment technology (e.g., SER followed by ISCO). If ISCO results in insufficient

LNAPL removal, or if SER results in excessive migration of dissolved phase contaminants, it may be appropriate to discontinue those operations and implement ISTR to address residual LNAPL and contamination in both soil and groundwater. EPA reserves its right to compel implementation of additional or expanded remedies at the FCP as it deems necessary to protect human health and the environment.

II. SPECIFIC COMMENTS ON THE REVISED RSR AND COST APPENDIX

1. **Section 2.5.3, 2013 LNAPL Sample Results, page 15** - The paragraph immediately following the bulleted list on page 15 identifies constituents of potential concern for groundwater at the FCP – including benzene, toluene, methylene chloride, phenol, 2,4-dimethylphenol, benzo(a)pyrene, naphthalene, and arsenic. This paragraph also states that higher arsenic concentrations in deep monitoring wells are attributed to the more reducing conditions at depth and proximity to historic Lake Michigan bottom sediments. Expand this paragraph to specify those arsenic concentrations which are believed to be representative of background and clarify whether arsenic exceedances reported in *shallow* groundwater are attributable to site activity or background conditions. In addition, expand the discussion to note that arsenic was carried forward for evaluation in the human health and ecological risk assessments discussed in Section 3.3 of the RSR and clarify whether the arsenic levels used in those assessments reflect only the low shallow groundwater concentrations or also include the higher deep groundwater concentrations. These same clarifications should be incorporated into EI documentation found in Appendix A.
2. **Section 4, Corrective Measure Objectives, page 23** - The last paragraph on page 23 states that the RSR includes discussion of “intended financial assurance mechanisms to ensure that active remedies and long-term operation and maintenance schedules can continue.” There is no discussion of financial assurance mechanisms in the RSR. Expand Section 6.1.2.5 to indicate which mechanism AMW intends to use to ensure funding for FCP cleanup. 
3. **Table 4-1, SER Processes and Metrics** - Because this table is intended to expand discussion of CAOs into more defined performance metrics for the FCP, it is unclear why it is limited to SER. If performance metrics will differ for the ISCO and ISTR options, the table should highlight those differences for easy comparison. The table title should be revised to reflect performance metrics without reference to any specific remedy (which has not yet been selected in Section 4 of the RSR). 
4. **Section 5.3, Technology 1 – Hydraulic Containment, page 25** - Hydraulic containment is an environmental cleanup technique that seeks to keep contamination from migrating in an uncontrolled manner from a defined source area. The approach detailed in Section 5.3 relies on hydraulic extraction (i.e., pump and treat). Replace the term “hydraulic containment” with “hydraulic extraction” where it appears throughout the RSR for clarity on the cleanup technology that was actually considered. 
5. **Section 6.1.2.5, Cost, pages 30 and 31** - The second paragraph in this section discusses the common element of groundwater monitoring which will be included as a component of all potential corrective measures alternatives. Correct the text to refer to three, rather than four, potential corrective measures alternatives. 
6. **Sections 6.2 through 6.4, Corrective Measures, pages 31 through 25** - These sections should be expanded to consider the ability of each corrective measure option to address soil contamination, dissolved phase groundwater contamination, and LNAPL mass. Technology-specific risks associated with enhanced mobility of contaminants or expanded contaminant footprints should also be noted.
7. **Appendix B, Estimated Corrective Measure Costs** - Cost tables in this appendix need to be supported with backup detail and assumptions used in generating the various estimates. Lump sum costs are generally unacceptable as they hinder third-party review and validation. Details on the scope of treatment,

monitoring (e.g., wells, analytical parameters), and well abandonment activity should be provided. Explanations should be provided as to how the technical assumptions were derived for each corrective measures alternative (e.g., number of injection and extraction wells, volume of surfactant and total solutions to be injected, number of temperature sensors, time frame and number of injection/heating events). At present, despite a varying number of wells to be installed, each option includes \$180,000 for well abandonment and only Table B-2 (ISCO) includes a separate line item for injection well abandonment. Such costs should also be added to Tables B-1 and B-3, along with costs for treatment/disposal/discharge of extracted materials from the subsurface during implementation of SER and ISTR. Until these issues are resolved so that the cost estimates are comprehensive and consistent, we cannot compare the three options in terms of cost.

III. COMMENT ON THE AMW RESPONSE TO EPA COMMENTS

On April 17, 2020, AMW issued responses to EPA comments on the initial version of the RSR. The responses are largely acceptable, but one issue warrants further discussion. In Specific Comments 1 and 3, EPA stressed that modeling conducted to estimate risks to surface water receptors is useful for prioritizing cleanup activity, but final cleanup goals should be based on applicable State of Indiana rules in 327 IAC 2-11-5. However, AMW continues to refer to modeled surface water concentrations in their response, the revised RSR, and EI documentation. In doing so, AMW fails to satisfy a key component of the State of Indiana rule: achievement of surface water quality standards at the groundwater-surface water interface. Detected COPC concentrations in wells closest to the Indiana Harbor Canal must be compared to Indiana Department of Environmental Management (IDEM) surface water standards (in addition to groundwater standards) to document achievement of CAOs, the CA725, and the CA750.

IV. COMMENTS ON APPENDIX A, EI DOCUMENTATION

While it looks like positive CA725 and CA750 determinations are achievable, the drafts are missing key technical details and are inappropriately formatted. Please revise the EI documentation to address the comments below.

1. CA725 Question 2: The response to this question should be revised to simply discuss contaminant concentrations in various media at the FCP.
 - As shown on numerous RSR figures, groundwater (shallow, intermediate, and deep) is known to be impacted by LNAPL and dissolved phase constituents above relevant IDEM standards. Tables and/or figures documenting the nature and extent of groundwater exceedances and LNAPL may be attached to the EI.
 - The CA725 should note that surface soil is comprised of clean fill brought to the FCP to eliminate direct contact risks, but subsurface soil remains impacted. COPC concentrations in soil below the clean fill should be presented and compared to applicable IDEM criteria for soil, including migration to groundwater levels.
 - Any available surface water or sediment data should be presented and evaluated against relevant criteria in this section of the CA725. Actual contaminant concentrations in groundwater immediately upgradient of the harbor should also be compared to surface water quality criteria to determine if there is a potential concern. It is inappropriate to use modeling surface water concentrations in the response to Question 2.
 - The response to this question in the CA725 should indicate whether concentrations of volatile soil or groundwater contaminants exceed vapor intrusion standards.

2. CA725 Question 2: The last paragraph in this response refers to the future LNAPL source area remediation. EIs are intended to be living documents reflecting a snapshot in time and updated when there are significant changes in site conditions. As such, it is inappropriate to discuss expected improvements relating to future cleanup activities and that discussion should be deleted.
3. CA725 Question 3: The response to this question should be provided, detailing potential pathways for exposure consistent with information presented in Section 3 and Figure 3-1. This response should also indicate whether buildings (occupied or unoccupied) are situated within 100 feet of volatile soil or groundwater contamination. This response is also the appropriate place to discuss the fact that groundwater is not used as a drinking water source and that there are potential exposures via fish consumption. There is no requirement to discuss level of risk in the response to Question 3.
4. CA725 Question 4: The response to this question generally walks through complete pathways and discusses whether the potential exposures are significant. This is also the place to discuss ICs that will formally eliminate complete pathways. For example, we can say that construction worker exposures to contaminated subsurface soil and groundwater would not be significant because the risks are known and proper personal protective equipment would be used. Information provided in the fourth paragraph on page 3 of the CA725 regarding arsenic exposures via fish consumption should also be moved to this response.
5. CA725 Question 5: Information provided in the fifth paragraph on page 3 of the CA725 regarding acceptable fish consumption levels should be moved to this response. In addition, this response should clarify whether a health advisory has been issued to alert the public to the recommendation that fish consumption be limited to 50 meals or less per year.
6. CA725 Question 6: While it is typical to conduct EI determinations on a facility-wide basis, AMW has completed the documentation to be reflective of a single portion of the facility (i.e., the FCP Area). This is acceptable, but the “Yes” language in the Question 6 response must be modified to refer to the FCP Area within the larger AMW facility to avoid confusion that the determination applies to the whole site.
7. CA750 Question 2: The response to this question should be revised to simply discuss contaminant concentrations in groundwater at the FCP. COPCs exceeding relevant IDEM standards should be identified and LNAPL impacts should be detailed (including a summary of LNAPL composition and thickness). As shown on numerous RSR figures, groundwater (shallow, intermediate, and deep) is known to be impacted by LNAPL and dissolved phase constituents above relevant IDEM standards. Tables and/or figures documenting the nature and extent of groundwater exceedances and LNAPL may be attached to the EI. The response should also indicate the date of the most recent area-wide groundwater monitoring event and how certain AMW is that the data is reflective of current conditions at the FCP. As the CA750 is not based on risk, discussion along those lines is not appropriate and should be eliminated.
8. CA750 Question 3: Information on the stability of both the LNAPL footprint and dissolved phase plumes over time should be presented in the response to this question.
9. CA750 Question 4: The response to this question must discuss the means by which groundwater discharges to surface water at the FCP, including a detailed discussion of the sheet pile wall and created gap. This response should also identify whether contaminant concentrations immediately upgradient of the surface water discharge point exceed groundwater standards.
10. CA750 Question 5: The response to this question should take a two-pronged approach. First, AMW should assess groundwater contaminant concentrations immediately upgradient of the surface water to IDEM surface water quality criteria, both directly and adjusted by a factor of 10 to account for mixing in the hyporheic zone. Secondly, the response should outline results of the risk analysis documenting problematic arsenic levels for fish consumption.

11. CA750 Question 6: The response to this question should also take a two-pronged approach. First, AMW should discuss limitations on acceptable fish consumption levels and clarify whether a health advisory has been issued to alert the public to the recommendation that fish consumption be limited to 50 meals or less per year. The response should then address water quality throughout the Indiana Harbor Canal and the inability to distinguish between impacts attributable to AMW from those attributable to other industry in the area, as noted in Section 3.2 of the RSR.
12. CA750 Question 7: The response to this question should include a summary of periodic monitoring conducted to date. must outline plans for continued monitoring of groundwater at the FCP, including both LNAPL and dissolved phase components. Monitoring wells should be identified (along with the purpose of monitoring each). Analytical methods and parameters should be specified. Frequency and duration of the planned monitoring program. AMW should also reiterate their commitment to implementation of an adaptive groundwater monitoring program in this response.
13. CA750 Question 8: While it is typical to conduct EI determinations on a facility-wide basis, AMW has completed the documentation to be reflective of a single portion of the facility (i.e., the FCP Area). This is acceptable, but the “Yes” language in the Question 8 response must be modified to refer to the FCP Area within the larger AMW facility to avoid confusion that the determination applies to the whole site.
14. The flow charts attached to each EI determination remain incomplete and should be modified to highlight the decision branches reflected in the text of each question.